

REMARKS

Applicants and Applicants' attorney express appreciation to the Examiner for the courtesies extended during the recent interview held on October 29, 2003. Reconsideration and allowance of the above-identified application are respectfully requested. Claims 1-71 are pending, wherein claims 1, 63 and 67 have been amended and claims 70 and 71 are new.

Claim 1 was amended to emphasize the latent dual cure nature of the claimed composition, which contains at least one polymerizable material, at least one photoinitiator, and at least one chemical initiator. As described in the specification and illustrated in Figures 2-4, the identities and concentrations of the polymerizable material, photoinitiator and chemical initiator are selected so that, when the composition is exposed to radiant energy, a portion of the composition at least partially polymerizes and adheres to a dental substrate, while an exposed surface of the composition remains at least partially unpolymerized and deformable. The chemical initiator is selected so that it does not initially cause the polymerizable material to polymerize but only after the composition is exposed to an amalgam restorative.

As described in the specification and illustrated in Figures 5-7, placement of an amalgam adjacent to the partially polymerized composition causes the deformable portion of the partially polymerized composition to become deformed, resulting in irregularities. Such irregularities create a much better mechanical bond between the amalgam and the composition upon further polymerization of the composition and curing of the amalgam. In this way, the final amalgam restorative can be mechanically anchored to the tooth while removing less of the tooth than is required following conventional amalgam placement techniques. This is an improvement over prior art amalgam bonding and placement techniques since, unlike composites, it is difficult, if not impossible, to form a strong chemical bond between amalgam, which is a blend of metals, and polymerizable compositions.

As discussed during the Examiner Interview, Mitra et al. neither teaches nor suggests a composition that includes a polymerizable material in combination with a photoinitiator and a chemical initiator. In fact, the Office Action acknowledges this at page 3, but goes on to state that Mitra et al. suggests the use of a photoinitiator and a chemical initiator. In fact, Mitra et al. specifically teaches that the photoinitiator and chemical initiator are alternative curing agents that are used separately:

The composition of the present invention may alternatively utilize a mode of initiation of the polymerization reaction to initiate a crosslinking reaction without the need to expose the system to visible light. A preferred alternative mode for initiation of the polymerization reaction is the incorporation of an oxidizing agent and a reducing agent as a redox catalyst system to enable the dental composition to cure via a redox reaction.

Col. 9, lines 15-22 (emphasis added).

Finally, the teaching cited in the Office Action for the proposition that Mitra et al. can be used to bond an amalgam to a dental substrate actually supports Applicants' view that Mitra et al. does not teach or suggest the composition of claim 1. At col. 11, lines 61-62, Mitra et al. teaches that the disclosed composition can be used to prime various dental substrates, such as "previously placed composite or amalgam, crowns and the like". Since the "previously placed" amalgam is already hard, there would be no point in formulating the composition according to claim 1, since no apparent benefit would follow. Providing a composition that is partially polymerized when exposed to radiant energy, but which includes an exposed surface that remains deformable would do nothing to promote a better mechanical bond between an adhesive and an existing hard amalgam restorative.

Ario et al. likewise fails to teach or suggest a composition that includes a polymerizable material, a photoinitiator, and a chemical initiator. Instead, Ario et al. discloses a method of bonding to a tooth that involves placing multiple layers of curable compositions. One such composition is a priming solution that includes either a chemical initiator or photoinitiator. Col. 8, lines 17-39. Another composition is a chemically curable adhesive composition that includes an oxidizing agent and a reducing agent. Col. 9, lines 8-45. Not only does Ario et al. fail to teach or suggest a polymerizable composition that includes both a photoinitiator and a chemical initiator, Ario et al. also fails to teach or suggest a composition that is specifically formulated so as to have the properties recited in claim 1, either as originally filed or as now amended.

Finally, Fischer et al. discloses a composition that is used to prime and seal dental and biological substrates. In one embodiment, the composition is used preparatory to filling a tooth with a composite resin. Since composite resins are able to form a chemical bond with polymerizable compositions, whether already polymerized or not, there is no need to ensure that "an exposed surface of the polymerizable material remains at least partially unpolymerized and deformable", as recited in claim 1. In other words, because composite resins can form a strong chemical bond with a cured polymerizable adhesive, there would be no reason or motivation,

given the combined teachings of Fischer et al., Mitra et al. and Ario et al., to formulate an adhesive that remained pliable after photocuring so as to promote a better mechanical bond between the adhesive and the composite resin. Because Fischer et al. does not disclose a method for bonding an amalgam restorative to a dental substrate, one of skill in the art would not have been motivated to modify or adjust the compositions of Fischer et al. in order to specifically possess the properties recited in claim 1 in order to promote a better mechanical bond between the adhesive and an amalgam restorative. Neither Mitra et al. nor Ario et al. provide any teaching or suggestion that would have motivated one of skill in the art to modify Fischer et al. to obtain the composition of claim 1, either as originally filed or as now amended. Similarly, the teachings Fischer et al. would not have motivated one of skill in the art to modify Mitra et al. or Ario et al. to obtain the composition of claim 1, either as originally filed or as now amended.

In view of the foregoing, Applicants submit that claim 1 as now amended is patentable over the art of record, as are claims 2-54, which depend from claim 1.

Claim 55 alternative claims a composition that comprises a polymerizable material, a photoinitiator, and a chemical initiator, wherein (1) the amount of photoinitiator "is less than what is stoichiometrically required to cause complete polymerization of the polymerizable material if irradiated with an excess of radiant energy in the absence of oxygen" and (2) the chemical initiator "is initially stable when mixed with the photoinitiator and polymerizable material but that decomposes when exposed to one or more metals contained in an amalgam restorative in order to cause further polymerization of the polymerizable material when the dental composition comes into contact with the amalgam restorative". As discussed above relative to claim 1, neither Mitra et al. nor Ario et al. teach nor suggest a composition of any kind that includes a polymerizable material, a photoinitiator, and a chemical initiator. It therefore follows that Mitra et al. and Ario et al. neither teach nor suggest a composition in which (1) the photoinitiator is included in an amount that "is less than what is stoichiometrically required to cause complete polymerization of the polymerizable material" and (2) the chemical initiator "is initially stable when mixed with the photoinitiator and polymerizable material but that decomposes when exposed to one or more metals contained in an amalgam restorative". Finally, Fischer et al. would not have motivated one of skill in the art, either alone or in combination with Mitra et al. and Ario et al., to provide an adhesive composition in which the photoinitiator is included in an amount that "is less than what is stoichiometrically required to cause complete

polymerization of the polymerizable material". For this reason, Applicants submit that claim 55 as originally filed is patentable over the art of record, as are the claims which depend therefrom.

Claim 63, as amended, is similar to claim 1 but further specifies that the composition "includes at least one polymerizable promotor and at least one polymerizable resin". For at least the reasons given above with respect to claim 1, Applicants submit that claim 63, as amended, is patentable over the art of record, as are the claims which depend therefrom.

Claim 67, as amended, alternatively recites a composition that comprises "at least two polymerizable materials, one of which is Bis-GMA in a concentration of up to about 4% by weight of the dental composition". The Office Action indicates that "the prior art fails to teach adding the low amounts of Bis-GMA resin" as recited in, *e.g.*, claim 15. Applicants therefore submit that claim 67, as amended, is patentable over the art of record, as are the claims which depend therefrom.

The Office Action indicates that claims 15-17, 32, 41-42, 44, 61 and 68-69 would be allowable if rewritten in independent form to include the limitation of the base claim and any intervening claims. Claim 70 represents claim 41 rewritten in independent form, and claim 71 represents claim 44 rewritten in independent form. Accordingly, Applicants submit that claims 70 and 71 are therefore in allowable form.

In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, or that may be overcome by an Examiner's Amendment, the Examiner is requested to contact the undersigned attorney.

Dated this ____ day of October 2003.

Respectfully submitted,



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